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AN INVESTIGATION TO MONITOR THE CAKING AND COKING PROPERTIES OF HAMMER MILL PRODUCTS AND CLEAN COAL SAMPLES FROM THE EMR LINGAN PILOT PLANT SAMPLED FROM MARCH 15, 1973 TO APRIL 10, 1973.

by

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AN INVESTIGATION TO MONITOR THE CAKING AND COKING PROPERTIES OF HAMMER MILL PRODUCTS AND CLEAN COAL SAMPLES FROM THE EMR LINGAN PILOT PLANT SAMPLED FROM MARCH 15, 1973 TO APRIL 10, 1973

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INTRODUCTION

This evaluation report deals with coal samples listed in Table 1 weighing 60 to 70 pounds received on April 13th and 19th, 1973, from the EMR Lingan Pilot Plant.

The chemical analyses were conducted by the Fuels Research Centre and included proximate analysis and total sulphur.

The samples were prepared for petrographic analysis according to ASTM Standard D-2797-72[1]. The maceral composition and mean maximum reflectance were determined according to ASTM Standards D-2798-72[2] and D-2799-72[3]. From the petrographic data the potential stability factor was calculated according to a modification of a method proposed by N. Schapiro and R.J. Gray[4]. The volume per cent of pyrite particles was determined microscopically by a point count method and converted to a weight per cent of pyritic sulphur.

The thermal rheological properties were characterized by the Ruhr Dilatation and the Free Swelling Index.

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In addition wet screen analyses were carried out on the coal samples and the results are listed in Table 3. The screen analysis was conducted using a Shotts wet screening apparatus.

The samples were carbonized in the Mines Branch 30 pound coke oven.

TABLE 1. LIST OF COAL SAMPLES

LAB. NO.	DESCRIPTION
2465-73	Clean coal, March 21 Corresponds to Feed Sample taken March 15, 1973.
2466-73	Clean coal, March 23 Corresponds to Feed Sample taken March 23, 1973.
2467-73	Clean coal, March 26 Corresponds to Feed Sample taken March 26.
2468-73	Clean coal, March 28 Corresponds to Feed Sample taken March 27.
2469-73	Clean coal, March 29 Corresponds to 10 tons Feed taken March 29.
2470-73	Clean coal, April 2, 1973, Run I Corresponds to Feed March 30.
2471-73	Clean coal, April 2, 1973, Run II Corresponds to Feed April 2.
2472-73	Feed, March 23 Sample from 10 tons of coal Corresponds to March 23 clean coal.
2473-73	Feed, March 26 Sample taken from 10 tons of coal Corresponds to clean coal March 26.
2474-73	Feed, March 27 Sample from 10 tons of coal Corresponds to clean coal March 28.
2475-73	Feed, March 29 Sample from 10 tons of coal Corresponds to clean coal March 29.
2476-73	Feed, March 30 Corresponds to clean coal April 2, Run I.
2477-73	Feed April 2 Corresponds to clean coal April 2, Run II.
2484-73	Clean Coal, April 4 Corresponds to Feed, April 3

TABLE 1. (Cont'd.) LIST OF COAL SAMPLES

LAB. NO.	DESCRIPTION
2490-73	Clean Coal, April 4 Corresponds to Feed, April 4
2489-73	Clean Coal, April 5 Corresponds to Feed, April 5 (Cour-e coal)
2488-73	Clean Coal, April 10 Corresponds to Feed, April 9
2485-73	Feed, April 3 Corresponds to clean coal, April 4 (M)
2483-73	Feed, April 4 Corresponds to clean coal, April 4 (A)
2487-73	Feed, April 5 Corresponds to clean coal, April 5
2486-73	Feed, April 9 Corresponds to clean coal, April 10

TABLE 2. Chemical and Thermal Rheological Data

Identification	
Laboratory Number	2465-73
Description	March 21 Clean Coal Corresponds to Feed* March 15.
Proximate Analysis (db)	
Ash .....%	2.8
Volatile Matter .....%	39.7
Fixed Carbon .....%	57.5
Sulphur (db) .....%	1.36
Dilatation	
Ti - Softening Temp. .....°C	383
Tii - Max. Contraction Temp. ..°C	445
Tiii - Max. Dilatation Temp. ...°C	473
Contraction .....%	24
Dilatation .....%	94
Free Swelling Index	
F.S.I.	4½

*Feed Sample March 15 not Received.

TABLE 3 Petrographic Analysis

Identification

Laboratory Number	2465-73
Description	March 21 Clean Coal

Distribution of Vitrinoid Types

Type No.	
6	0.7 %
7	19.6 %
8	50.9 %
9	4.6 %
	%

Reactive Components

Total Vitrinoid	75.8 %
Reactive Semi-fusinoid (1/3)	1.2 %
Exinoid + Resinoid	7.9 %
Total	84.9 %

Inert Components

Inert Semi-fusinoid (2/3)	2.3 %
Micrinoid	6.5 %
Fusinoid	4.4 %
Mineral Matter	1.9 %
Total	15.1 %

Petrographic Indices

Mean Reflectance	0.83 %
Balance Index	0.53
Strength Index	2.86
Stability Index	25.0

TABLE 4 - Carbonization Data- Tests in 30lb. Oven

Test Identification Number.....	446
Date of Test.....	18.5.73
Laboratory Number (refer for analysis of charge).....	2465-73

COMPONENT COALS IN CHARGE (% by wt. on db)	Clean Coal March 21 Corresponds to Feed March 15
CARBONIZATION DATA	
Net Weight of Charge (wet).....lb	30.39
Moisture in Charge.....%	5.3
ASTM Bulk Density (wet).....lb/ft^3	
Oven Bulk Density (db).....lb/ft^3	43.6
CARBONIZATION RESULTS	
Gross Coking Time.....hr:min	2:30
Maximum Wall Pressure.....lb/in^2	
Coke Yield Actual.....%	67.3
Mean Coke size.....in	1.59
Apparent Specific Gravity.....	
Screen Analysis of Coke (cumulative percentage retained on)	
3 inch sieve.....	
2 inch sieve.....	19.5
1 1/2 inch sieve.....	55.2
1 inch sieve.....	84.2
3/4 inch sieve.....	92.7
1/2 inch sieve.....	95.1
Percentage -1/2 inch (breeze).....	4.9
Tumbler Test (ASTM)	
Stability Factor.....	32.6
Hardness Factor.....	52.9

TABLE 5 Chemical and Thermal Rheological Data

Identification						
Laboratory Number	2466-73	2467-73	2468-73	2469-73	2470-73	2471-73
Description ..... Clean Coal	March 23	March 26	March 28	March 29	April 2 Run I	April 2 Run II
Proximate Analysis (db)						
Ash .....%	2.6	2.4	4.3	2.9	3.1	2.9
Volatile Matter .....%	39.7	38.7	38.7	39.1	39.6	38.7
Fixed Carbon .....%	57.7	58.9	57.0	57.0	57.3	58.4
Sulphur (db) .....%	1.45	1.34	1.21	1.35	1.61	1.55
Dilatation						
Ti - Softening Temp. °C	392	395	378	385	386	383
Tii - Max. Contraction Temp. °C	433	436	425	429	439	434
Tiii - Max. Dilatation Temp. °C	464	464	455	458	467	461
Contraction .....%	26	30	29	28	28	28
Dilatation .....%	125	115	117	114	128	114
Free Swelling Index						
F.S.I.	5½	6	6	5½	7	5

TABLE 6 Petrographic Analysis of Component Coals

Identification						
Laboratory Number	2466-73	2467-73	2468-73	2469-73	2470-73	2471-73
Description	March 23	March 26	March 28	March 29	April 2 Run I	April 2 Run II
Distribution of Vitrinoid Types						
Type No.						
6 ....%	4.3		1.1	1.1	2.5	2.6
7 ....%	21.3	27.2	19.2	26.1	23.9	30.2
8 ....%	43.2	43.8	49.6	38.1	44.0	39.3
9 ....%	6.3	4.5	4.5	8.6	2.4	2.7
....%						
Reactive Components						
Total Vitrinoid ....%	75.1	75.5	74.4	73.9	72.8	74.8
Reactive Semi-fusinoid (1/3)...%	1.3	1.8	1.7	1.4	1.3	1.0
Exinoid + Resinoid ....%	7.2	7.9	7.6	8.2	7.7	9.6
Total ....%	83.6	85.2	83.7	83.5	81.8	85.4
Inert Components						
Inert Semi-fusinoid (2/3).....%	2.7	3.5	3.5	2.7	2.6	1.9
Micrinoid ....%	7.6	6.4	6.2	8.1	8.4	6.6
Fusinoid ....%	4.3	3.3	4.0	3.8	5.1	4.1
Mineral Matter ....%	1.8	1.6	2.6	1.9	2.1	2.0
Total ....%	16.4	14.8	16.3	16.5	18.2	14.6
Petrographic Indices						
Mean Reflectance ....%	0.82	0.83	0.83	0.82	0.81	0.81
Balance Index	0.60	0.53	0.58	0.60	0.69	0.54
Strength Index	2.89	2.86	2.89	2.91	2.88	2.82
Stability Index	28.3	25.0	28.0	29.0	29.5	23.6

TABLE 7 - Carbonization Data - Tests in 30lb Oven

Test Identification Number	474	445	460	468	448	450
Date of Test	24-7-73 Repeat of 442	17-5-73	21-6-73	6-7-73	29-5-73	5-6-73
Laboratory Number (refer for analysis of charge)	2466-73	2467-73	2468-73	2469-73	2470-73	2471-73
COMPONENT COALS IN CHARGE (% by wt. on db) Clean Coal	March 23	March 26	March 27	March 29	March 30 Run I	April 2 Run II
CARBONIZATION DATA						
Net Weight of Charge (wet) ..... lb	32.26	31.20	31.58	29.60	30.67	31.59
Moisture in Charge ..... %	3.8	2.7	3.3	5.4	4.1	3.6
ASTM Bulk Density (wet) ..... lb/ft^3	47.0	46.0	46.3	42.4	44.6	46.1
Oven Bulk Density (db) ..... lb/ft^3						
CARBONIZATION RESULTS						
Gross Coking Time ..... hr:min	2:15	2:35	2:46	2:16	2:40	2:28
Maximum Wall Pressure ..... lb/in^2	66.6	63.4	65.1	67.0	65.3	66.9
Coke Yield Actual ..... %	1.52	1.54	1.58	1.54	1.48	1.54
Mean Coke size ..... in						
Apparent Specific Gravity						
Screen Analysis of Coke (cumulative percentage retained on)						
3 inch sieve	17.9	19.1	22.0	18.9	13.0	17.2
2 inch sieve	50.2	50.1	54.1	51.5	47.2	51.8
1 1/2 inch sieve	82.6	83.5	82.1	83.9	82.0	85.2
1 inch sieve	90.8	92.2	91.6	90.6	91.6	91.7
3/4 inch sieve	93.7	94.5	94.7	93.4	94.6	94.7
1/2 inch sieve						
Percentage -1/2 inch (breeze)	6.3	5.5	5.3	6.6	5.4	5.3
Tumbler Test (ASTM)						
Stability Factor	37.0	35.1	42.1	37.7	40.5	36.2
Hardness Factor	55.3	52.2	57.0	54.5	58.7	53.6

TABLE 8 Chemical and Thermal Rheological Data

Identification						
Laboratory Number	2472-73	2473-73	2474-73	2475-73	2476-73	2477-73
Description.....						
Feed Coal	March 23	March 26	March 27	March 29	March 30 Run I	April 2 Run II
Proximate Analysis (db)						
Ash .....%	18.8	18.4	24.0	15.5	21.3	14.2
Volatile Matter .....%	33.2	32.9	31.6	34.0	32.0	34.3
Fixed Carbon .....%	48.0	48.7	44.4	50.5	46.7	51.5
Sulphur (db).....%	1.93	1.98	2.34	2.38	2.32	2.31
Dilatation						
Ti - Softening Temp. .....°C	410	401	407	401	407	400
Tii - Max. Contraction Temp. °C	445	445	445	435	449	437
Tiii - Max. Dilatation Temp. °C	467	470	464	458	470	461
Contraction .....%	26	28	25	26	25	28
Dilatation .....%	34	38	21	54	27	47
Free Swelling Index						
F.S.I.	5	5	4	5	6	5

TABLE 9 Petrographic Analysis

Identification						
Laboratory Number	2472-73	2743-73	2474-73	2475-73	2476-73	2477-73
Description	March 23	March 26	March 27	March 29	March 30 Run I	April 2 Run II
Feed Coal						
Distribution of Vitrinoid Types						
Type No.						
6 ....%	3.5	2.4	1.8	3.2	2.8	2.9
7 ....%	17.6	20.5	19.5	20.4	29.3	26.6
8 ....%	38.8	39.8	39.9	42.0	34.1	39.1
9 ....%	7.0	3.6	4.6	3.2	0.9	1.9
10 ....%	1.2	1.2				
Reactive Components						
Total Vitrinoid ....%	68.1	67.5	65.8	68.8	67.1	70.5
Reactive Semi-fusinoid (1/3)...%	1.1	1.2	1.2	1.3	1.1	1.2
Exinoid + Resinoid ....%	7.6	7.1	7.0	7.7	6.6	6.8
Total ....%	76.8	75.8	74.0	77.8	74.8	78.5
Inert Components						
Inert Semi-fusinoid (2/3)....%	2.1	2.4	2.3	2.5	2.3	2.3
Micrinoid ....%	6.1	5.4	4.3	5.6	5.1	5.8
Fusinoid ....%	3.5	5.1	4.3	4.6	4.5	4.7
Mineral Matter ....%	11.5	11.3	15.1	9.5	13.3	8.7
Total ....%	23.2	24.2	26.0	22.2	25.2	21.5
Petrographic Indices						
Mean Reflectance ....%	0.83	0.82	0.82	0.82	0.80	0.81
Balance Index	0.91	0.98	1.06	0.88	1.09	0.86
Strength Index	2.98	2.95	2.93	2.87	2.86	2.90
Stability Index	33.8	33.3	32.7	31.2	31.8	32.0

TABLE 10 Carbonization Data- Tests in 30lb Oven

Test Identification Number.....	447	449	444	451	463	462
Date of Test.....	24.5.73	30.5.73	16.5.73	6.6.73	27.6.73	26.6.73
Laboratory Number (refer for analysis of charge).....	2472-73	2473-73	2474-73	2475-73	2476-73	2477-73
COMPONENT COALS IN CHARGE (% by wt. on db) Feed Coal	March 23	March 26	March 27	March 29	March 30 Run I	April 2 Run II
CARBONIZATION DATA						
Net Weight of Charge (wet).....lb	34.49	31.17	34.91	34.96	34.98	34.38
Moisture in Charge.....%	2.6	4.2	3.2	2.5	2.6	3.0
ASTM Bulk Density (wet).....lb/ft^3						
Oven Bulk Density (db).....lb/ft^3	50.4	45.2	51.2	51.7	61.6	50.5
CARBONIZATION RESULTS						
Gross Coking Time.....hr:min	2:45	2:40	2:42	2:45	2:50	2:50
Maximum Wall Pressure.....lb/in^2						
Coke Yield Actual.....%	71.1	77.4	73.5	70.8	73.2	69.9
Mean Coke size.....in	1.90	1.93	2.01	1.87	1.80	1.92
Apparent Specific Gravity.....						
Screen Analysis of Coke (cumulative percentage retained on)						
3 inch sieve.....	48.4	52.4	59.1	42.9	41.3	52.0
2 inch sieve.....	74.0	74.3	79.4	72.9	67.6	72.1
1 1/2 inch sieve.....	87.9	87.8	89.3	87.4	84.4	89.0
1 inch sieve.....	92.2	92.3	92.1	92.0	89.2	92.9
3/4 inch sieve.....	94.1	94.3	94.0	94.7	93.0	95.3
1/2 inch sieve.....						
Percentage -1/2 inch (breeze).....	5.9	5.7	6.0	5.3	7.0	4.7
Tumbler Test (ASTM)						
Stability Factor.....	20.3	26.2	24.3	30.9	18.7	32.8
Hardness Factor.....	37.4	42.8	35.5	46.8	31.9	48.4

TABLE 11 Chemical and Thermal Rheological Data

Identification				
Laboratory Number	2484-73	2490-73	2489-73	2488-73
Description				
Clean Coal	April 4	April 4	April 5	April 10
Proximate and Sulphur Analysis (db)				
Ash .....%	3.7	3.0	3.0	3.3
Volatile Matter .....%	38.9	39.0	39.0	39.6
Fixed Carbon .....%	57.4	58.0	58.0	57.1
Sulphur (db) .....%	1.50	1.57	1.31	1.25
Dilatation				
Ti - Softening Temp. ..... °C	391	395	386	392
Tii - Max. Contraction Temp. °C	432	435	433	438
Tiii - Max. Dilatation Temp.. °C	460	461	461	464
Contraction ..... %	30	29	31	32
Dilatation ..... %	93	96	106	122
Free Swelling Index				
F.S.I.	5	5	4½	5

TABLE 12 Petrographic Analysis of Component Coals

Identification				
Laboratory Number	2484-73	2490-73	2489-73	2488-73
Description	April 4	April 4	April 5	April 10
Clean Coal				
Distribution of Vitrinoid Types				
Type No.				
6.....%	1.0	0.8	2.2	4.8
7.....%	15.3	22.4	14.6	23.1
8.....%	47.8	44.6	56.1	48.2
9.....%	11.4	6.7	3.4	
.....%				
Reactive Components				
Total Vitrinoid .....%	75.5	74.5	76.3	76.1
Reactive Semi-fusinoid (1/3)...%	1.4	1.3	1.2	1.3
Exinoid + Resinoid .....%	7.4	9.0	9.1	8.7
Total .....%	84.3	84.8	86.6	86.1
Inert Components				
Inert Semi-fusinoid (2/3).....%	2.8	2.6	2.5	2.6
Micrinoid .....%	6.5	7.1	6.3	6.5
Fusinoid .....%	4.0	3.5	2.6	2.7
Mineral Matter .....%	2.4	2.0	2.0	2.1
Total .....%	15.7	15.2	13.4	13.9
Petrographic Indices				
Mean Reflectance .....%	0.84	0.83	0.83	0.81
Balance Index	0.54	0.54	0.46	0.51
Strength Index	2.93	2.88	2.83	2.80
Stability Index	27.3	25.8	21.2	22.0

TABLE 13 Carbonization Data - Tests in 30lb Oven

Test Identification Number.....	466	467	472	471
Date of Test.....	4.7.73	5.7.73	19.7.73 Repeat of 437	17.7.73 Repeat of 438
Laboratory Number (refer for analysis of charge).....	2484-73	2490-73	2489-73	2488-73
COMPONENT COALS IN CHARGE (% by wt. on db)	Clean Coal April 4 Corresponds to Feed April 3	Clean Coal April 4 Corresponds to Feed April 4	Clean Coal April 5 Corresponds to Feed April 5 (Coarse Coal)	Clean Coal April 10 Corresponds to Feed April 10
CARBONIZATION DATA				
Net Weight of Charge (wet).....lb	33.11	32.14	31.62	32.29
Moisture in Charge.....%	2.6	3.4	8.9	9.2
ASTM Bulk Density (wet).....lb/ft^3				
Oven Bulk Density (db).....lb/ft^3	49.0	46.9	43.6	44.5
CARBONIZATION RESULTS				
Gross Coking Time.....hr:min	2:30	2:30	2:18	2:27
Maximum Wall Pressure.....lb/in^2				
Coke Yield Actual.....%	66.7	68.5	66.0	67.4
Mean Coke size.....in	1.46	1.55	1.54	1.44
Apparent Specific Gravity.....	-			
Screen Analysis of Coke (cumulative percentage retained on)				
3 inch sieve.....	13.3	19.3	20.1	10.6
2 inch sieve.....	44.8	50.8	48.7	47.6
1 1/2 inch sieve.....	81.2	82.9	83.6	79.2
1 inch sieve.....	91.3	91.8	91.5	89.8
3/4 inch sieve.....	94.5	95.4	94.7	93.5
1/2 inch sieve.....				
Percentage -1/2 inch (breeze).....	5.5	4.6	5.3	6.5
Tumbler Test (ASTM)				
Stability Factor.....	38.4	30.3	34.0	24.1
Hardness Factor.....	55.4	53.5	53.6	36.5

TABLE 14 Chemical and Thermal Rheological Data

Identification				
Laboratory Number	2485-73	2483-73	2487-73	2486-73
Description				
Feed Coal	April 3	April 4	April 5	April 9
Proximate and Sulphur Analysis (db)				
Ash .....%	17.0	13.1	12.2	11.2
Volatile Matter .....%	34.1	34.8	35.7	35.6
Fixed Carbon .....%	48.9	52.1	52.1	53.2
Sulphur (db) .....%	2.65	2.57	2.40	2.13
Dilatation				
Ti - Softening Temp. ..... °C	401	400	395	395
Tii - Max. Contraction Temp. °C	439	437	440	432
Tiii - Max. Dilatation Temp.. °C	463	461	464	458
Contraction ..... %	28	28	28	27
Dilatation ..... %	42	61	69	69
Free Swelling Index				
F.S.I.	5½	6½	6	6

TABLE 15 Petrographic Analysis of Component Coals

Identification				
Laboratory Number	2485-73	2483-73	2487-73	2486-73
Description	April 3	April 4	April 5	April 9
Feed Coal				
Distribution of Vitrinoid Types				
Type No.				
6 ....%	1.4	0.9	1.8	
7 ....%	12.2	13.6	14.2	10.9
8 ....%	43.3	42.3	48.1	58.1
9 ....%	10.9	14.5	6.2	3.3
10 ....%			0.9	
Reactive Components				
Total Vitrinoid ....%	67.8	71.3	71.2	72.3
Reactive Semi-fusinoid (1/3)...%	1.2	0.9	1.8	1.4
Exinoid + Resinoid ....%	6.4	7.2	7.1	6.9
Total ....%	75.4	79.4	80.1	80.6
Inert Components				
Inert Semi-fusinoid (2/3).....%	2.4	1.9	3.7	2.9
Micrinoid ....%	6.9	6.3	5.1	6.0
Fusinoid ....%	4.7	4.3	3.5	3.4
Mineral Matter ....%	10.6	8.1	7.6	7.1
Total ....%	24.6	20.6	19.9	19.4
Petrographic Indices				
Mean Reflectance ....%	0.85	0.85	0.83	0.84
Balance Index	0.93	0.74	0.73	0.70
Strength Index	3.03	3.04	2.97	2.95
Stability Index	35.0	34.0	32.4	31.5

TABLE 16 Carbonization Data - Tests in 30lb Oven

Test Identification Number.....	454	440	465	443
Date of Test.....	28.6.73	7.5.73	3.7.73	14.5.73
Laboratory Number (refer for analysis of charge).....	2485-73	2483-73	2487-73	2486-73
COMPONENT COALS IN CHARGE (% by wt. on db)	Feed April 3 Corresponds to Clean Coal April 4(M)	Feed April 4 Corresponds to Clean Coal April 4(A)	Feed April 5 Corresponds to Clean Coal April 5	Feed April 9 Corresponds to Clean Coal April 10
CARBONIZATION DATA				
Net Weight of Charge (wet).....lb	34.62	34.50	34.61	34.41
Moisture in Charge.....%	2.8	2.7	3.2	2.6
ASTM Bulk Density (wet).....lb/ft^3				
Oven Bulk Density (db).....lb/ft^3	51.0	50.8	50.8	50.8
CARBONIZATION RESULTS				
Gross Coking Time.....hr:min	2:50	2:40	2:55	2:40
Maximum Wall Pressure.....lb/in^2				
Coke Yield Actual.....%	72.5	70.9	69.9	70.0
Mean Coke size.....in	1.90	1.87	1.86	1.76
Apparent Specific Gravity.....				
Screen Analysis of Coke (cumulative percentage retained on)				
3 inch sieve.....				
2 inch sieve.....	53.3	50.8	48.0	38.1
1 1/2 inch sieve.....	68.8	70.9	69.6	65.2
1 inch sieve.....	84.1	83.5	85.6	83.9
3/4 inch sieve.....	90.6	89.5	90.9	90.8
1/2 inch sieve.....	94.1	93.4	94.4	94.3
Percentage -1/2 inch (breeze).....	5.9	6.6	5.6	5.7
Tumbler Test (ASTM)				
Stability Factor.....	16.8	14.0	22.9	21.8
Hardness Factor.....	33.6	32.8	42.2	40.8

TABLE 17 Microscopically Determined Pyritic Sulphur

SAMPLE NO.	PYRITE, VOLUME PER CENT	PYRITE SULPHUR, WEIGHT PER CENT	TOTAL SULPHUR BY THE ESCHKA METHOD	DIFFERENCE (APPROXIMATELY EQUAL TO ORGANIC SULPHUR)
2465-73	0.89	0.61	1.36	0.75
2466-73	1.28	0.88	1.45	0.57
2467-73	0.99	0.68	1.35	0.67
2468-73	1.09	0.75	1.21	0.46
2469-73	1.38	0.94	1.35	0.41
2470-73	2.06	1.41	1.61	0.20
2471-73	0.99	0.68	1.55	0.87
2472-73	2.15	1.47	1.93	0.46
2473-73	2.34	1.60	1.98	0.38
2474-73	2.82	1.93	2.34	0.41
2475-73	2.72	1.86	2.38	0.52
2476-73	2.72	1.86	2.32	0.46
2477-73	2.42	1.67	2.31	0.64
2483-73	3.10	2.12	2.57	0.45
2484-73	1.28	0.88	1.52	0.64
2485-73	3.29	2.25	2.65	0.40
2486-73	4.03	2.76	3.13	0.37
2487-73	2.91	1.99	2.40	0.41
2488-73	1.38	0.94	1.25	0.31
2489-73	1.38	0.94	1.31	0.37
2490-73	1.19	0.81	1.57	0.76

OBSERVATIONS AND DISCUSSIONS

Ash Level

The ash content on a dry basis of the feed coal ranges from 11.2 per cent to 24.0 per cent with an average value of 16.6 per cent.

The ash content of the clean coal on a dry basis ranges from 2.4 per cent to 4.3 per cent with an average value of 3.1 per cent.

The average reduction in the ash level by beneficiating the raw coal through the EMR Lingan Pilot Plant is 81.3 per cent.

Sulphur Content

The sulphur content on a dry basis of the feed coal ranges from 1.93 per cent to 2.65 per cent with an average value of 2.40 per cent.

The sulphur content on a dry basis of the clean coal ranges from 1.21 to 1.61 per cent with an average value of 1.41 per cent.

The average reduction in the sulphur content by beneficiating the raw coal through the EMR Lingan Pilot Plant is 38.7 per cent.

Thermal Rheology

The Free Swelling Index values increased through cleaning by an average of one unit for the samples taken from March 23 to April 2. The Free Swelling Index decreased through cleaning an average of one unit for the samples taken from April 3 to April 10.

The Ruhr dilatation values for the feed samples range from 21 per cent to 69 per cent with an average value of 46 per cent. The Ruhr dilatation values for the clean coal samples range from 93 to 128 per cent with an average value of 111 per cent. The average increase in dilatation

by beneficiating the ROM coal through the EMR Lingan Pilot Plant is 58.6 per cent.

Petrography

The average increase in reactive components through beneficiation is 7.6 per cent which is due mainly to an average loss of 9.6 per cent of mineral matter.

The average maximum spectral reflectance of the coal samples is 0.83 per cent which, based on this reflectance value, places this coal in the high volatile B bituminous class. However, as noted in an earlier report, based on the ASTM classification, the coal is in the high volatile A bituminous class.

From the volume per cent of pyrite obtained from a microscopic point count, the weight per cent of pyritic sulphur was computed from the following formula:

Pyritic Sulphur = Volume per cent Pyrite(FeS_2) x 1.28 x 0.5345

where 1.28 is the conversion factor of volume per cent to weight per cent, 0.5345 is the chemical conversion factor of pyrite (FeS_2) to sulphur (S).

Assuming from earlier analyses that the sulphate sulphur value is very low, the difference between total sulphur and the pyritic sulphur is approximately equal to the organic sulphur, then the average organic sulphur value is approximately 0.50 per cent.

Carbonization

The following table shows the main values as obtained from the 30 lb. oven tests.

TABLE

CLEAN COAL

Sample	Yield	M.C.S.	Breeze	Stability	Hardness
March 21st	67.3	1.59	4.9	32.6	52.9
" 23rd	66.6	1.52	6.3	37.0	55.3
" 26th	63.4	1.54	5.5	35.1	52.2
" 28th	65.1	1.58	5.3	42.1	47.0
" 39th	67.0	1.54	6.6	37.7	54.5
April 2nd Run I	65.3	1.48	5.4	40.5	58.7
" 2nd Run II	66.9	1.54	5.3	36.2	53.6
" 4th Morning	66.7	1.46	5.5	38.4	55.4
" 4th Afternoon	68.5	1.55	4.6	30.3	53.5
" 5th	66.0	1.54	5.3	34.0	53.6
" 10th	67.4	1.44	6.5	24.1	36.5

FEED COAL

Sample	Yield	M.C.S.	Breeze	Stability	Hardness
March 23rd	71.1	1.90	5.9	20.3	37.4
" 26th	77.4	1.93	5.7	26.2	42.8
" 27th	73.5	2.01	6.0	24.3	35.5
" 29th	70.8	1.87	5.3	30.9	46.8
" 30th	73.2	1.80	7.0	18.7	31.9
April 2nd	69.9	1.92	4.7	32.8	48.4
" 3rd	72.5	1.90	5.9	16.8	33.6
" 4th	70.9	1.87	6.6	14.0	32.8
" 5th	69.9	1.86	5.6	22.9	42.2
" 6th	70.0	1.76	5.7	21.8	40.8

From the above summary, the significant aspects would appear to be that in the "clean coal" samples the Stability and Hardness factors are appreciably higher than in the "feed" samples, which is the usual result of ash reduction by washing. In addition, it will be noted that the Mean Coke Size value is considerably higher in the "feed" samples than in the "clean coal" samples, and this could be due to the influence of the ash constituents reducing the amount of shrinkage occurring during carbonization, in the case of the "feed" samples. This would tend to reduce fissuring and result in a coke of larger particle size - although as pointed out above, it is generally less strong.

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POOR

QUALITY

ORIGINAL